

L. B. DOMAN.
PLAYING APPARATUS FOR MUSICAL INSTRUMENTS.

APPLICATION FILED MAY 31, 1902.

7 SHEETS—SHEET 1.

Fig. 1.

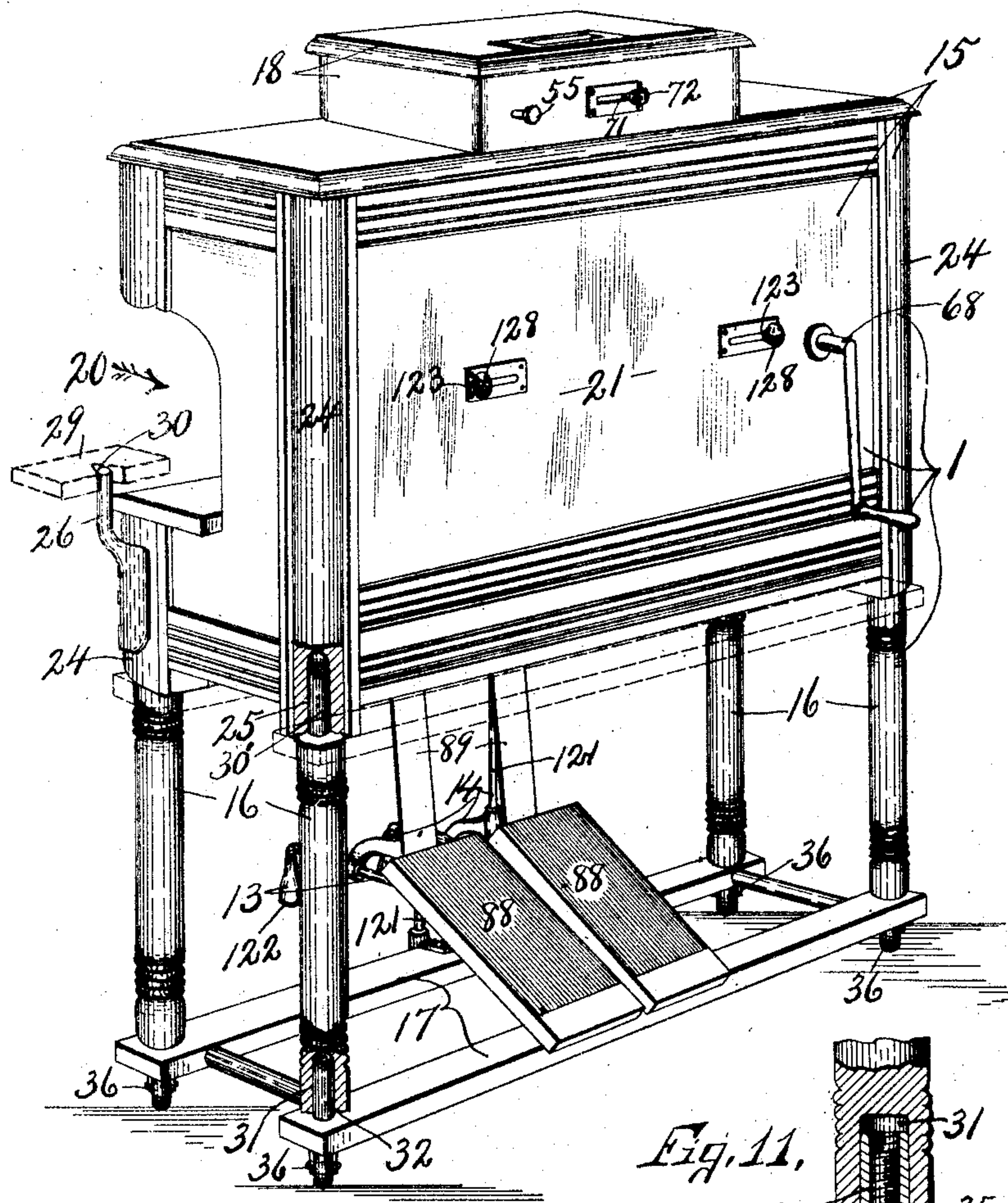
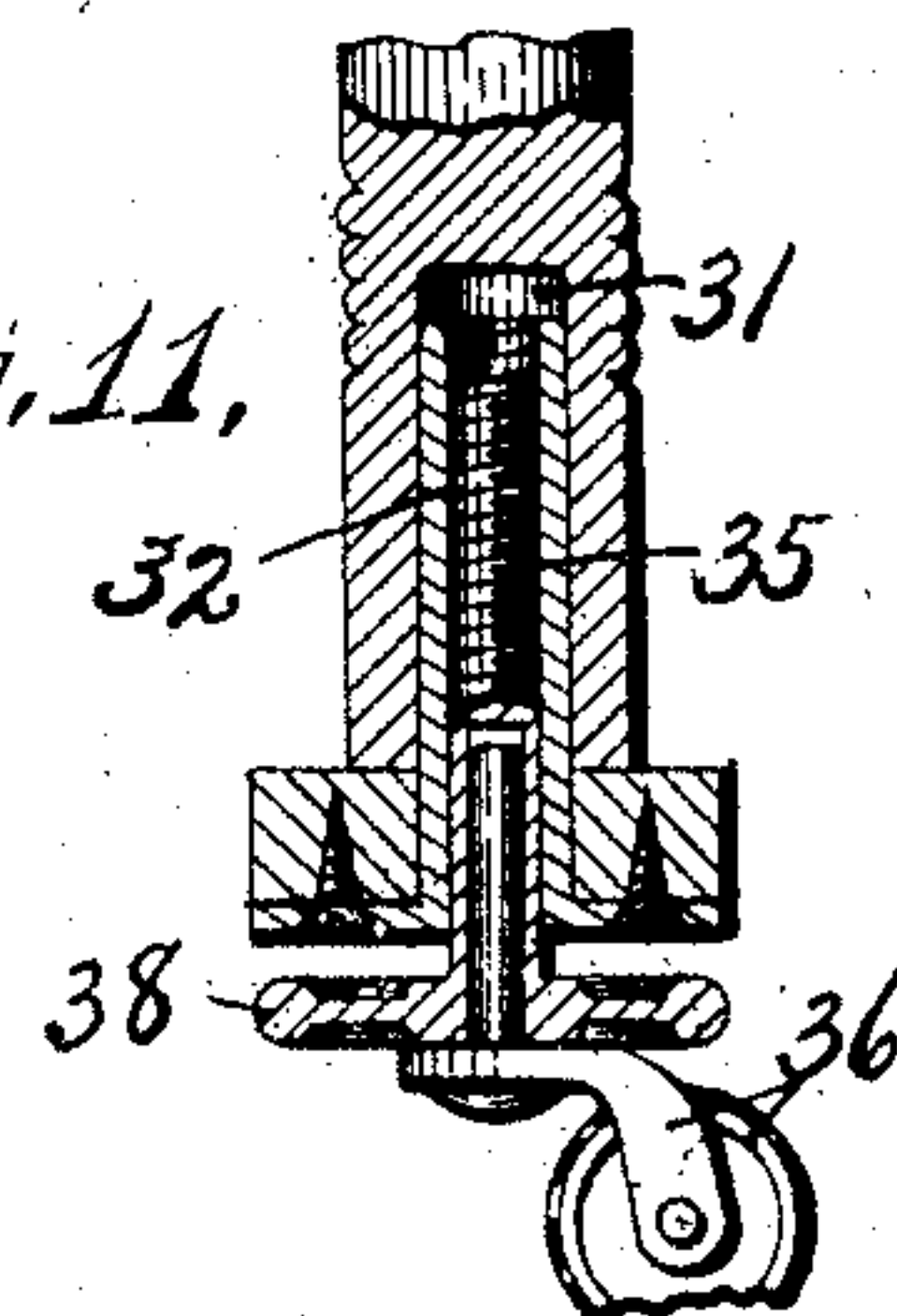


Fig. 11.



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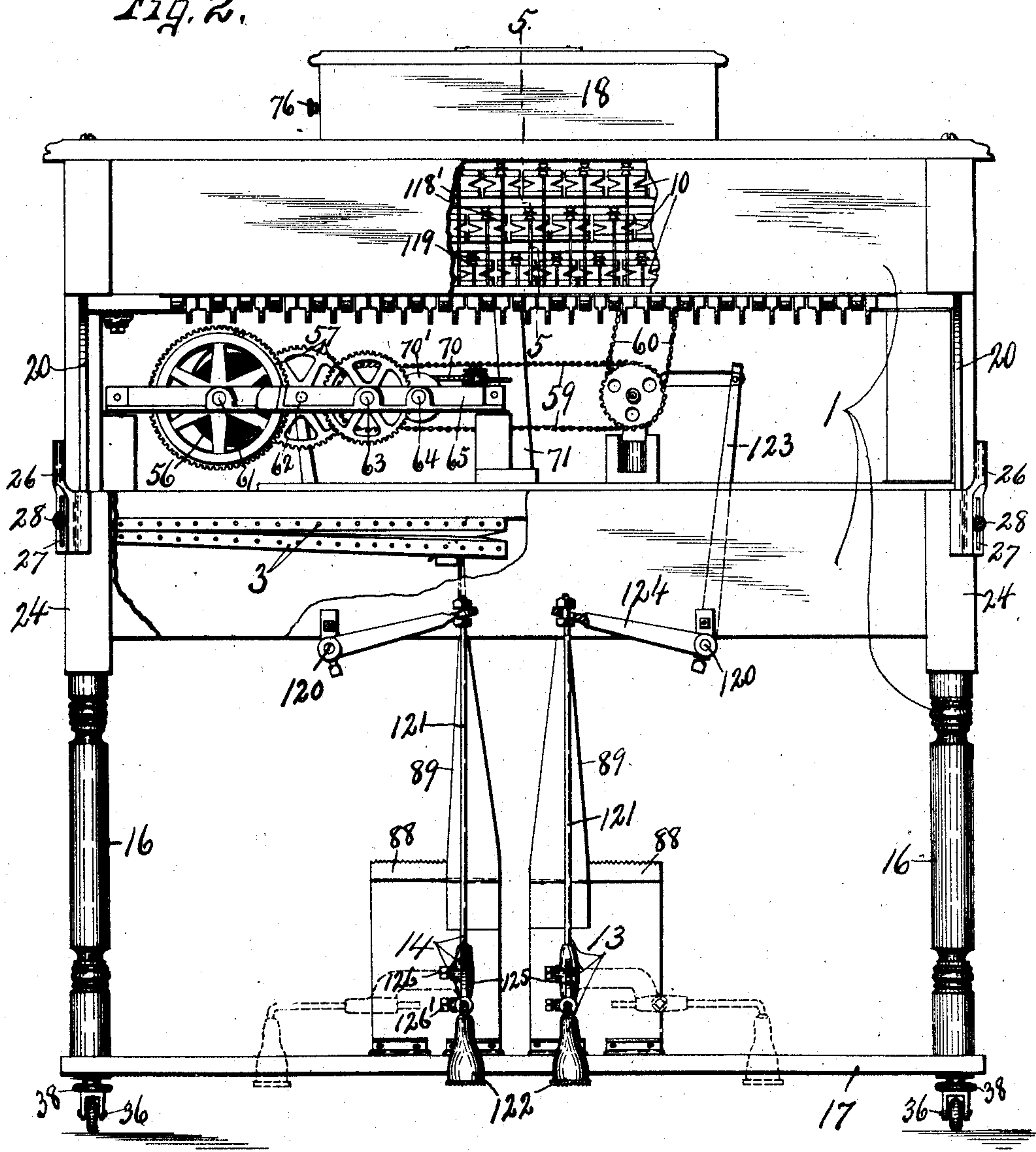
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7 SHEETS—SHEET 2.

Fig. 2.



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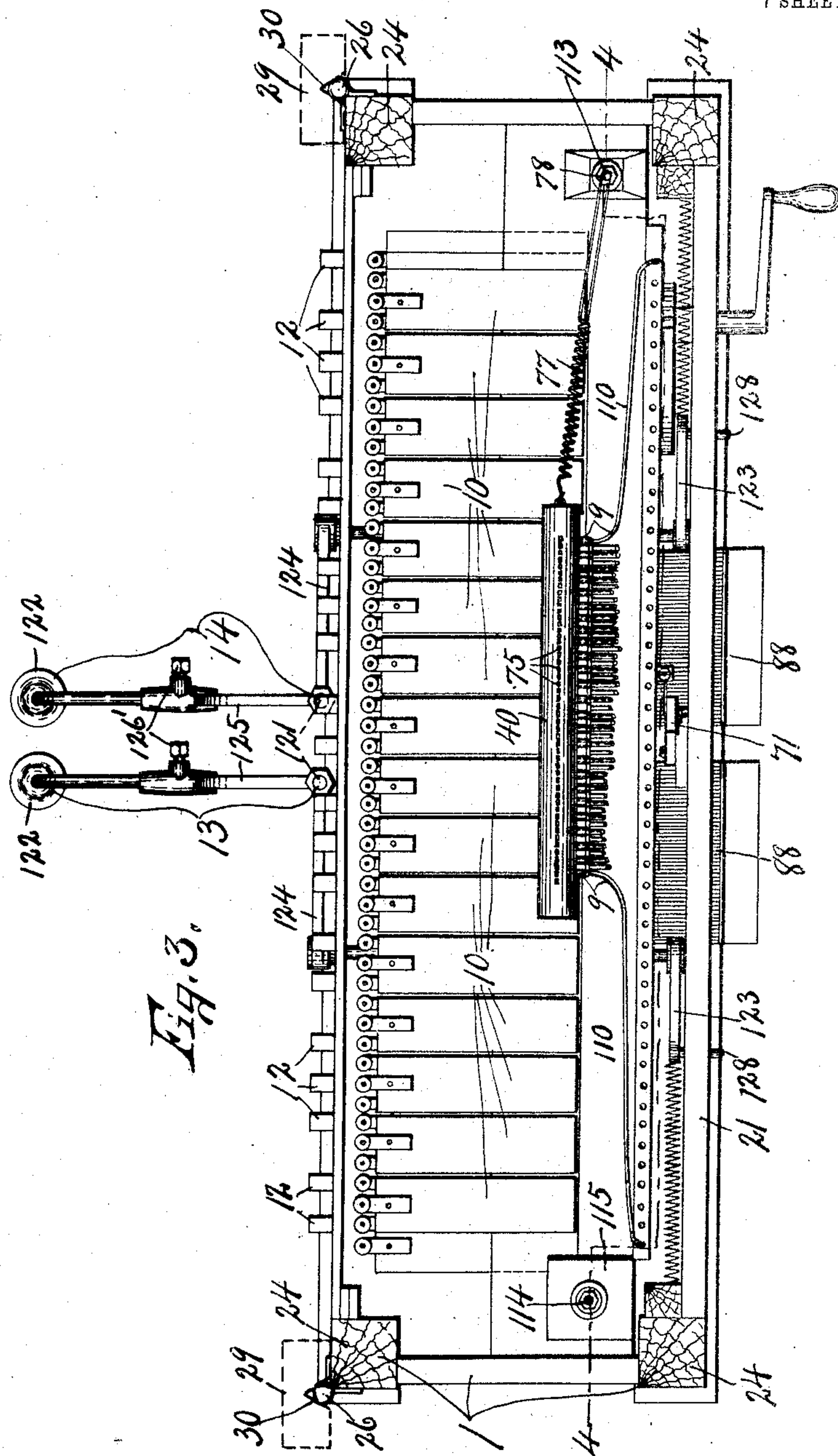
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7 SHEETS—SHEET 3.



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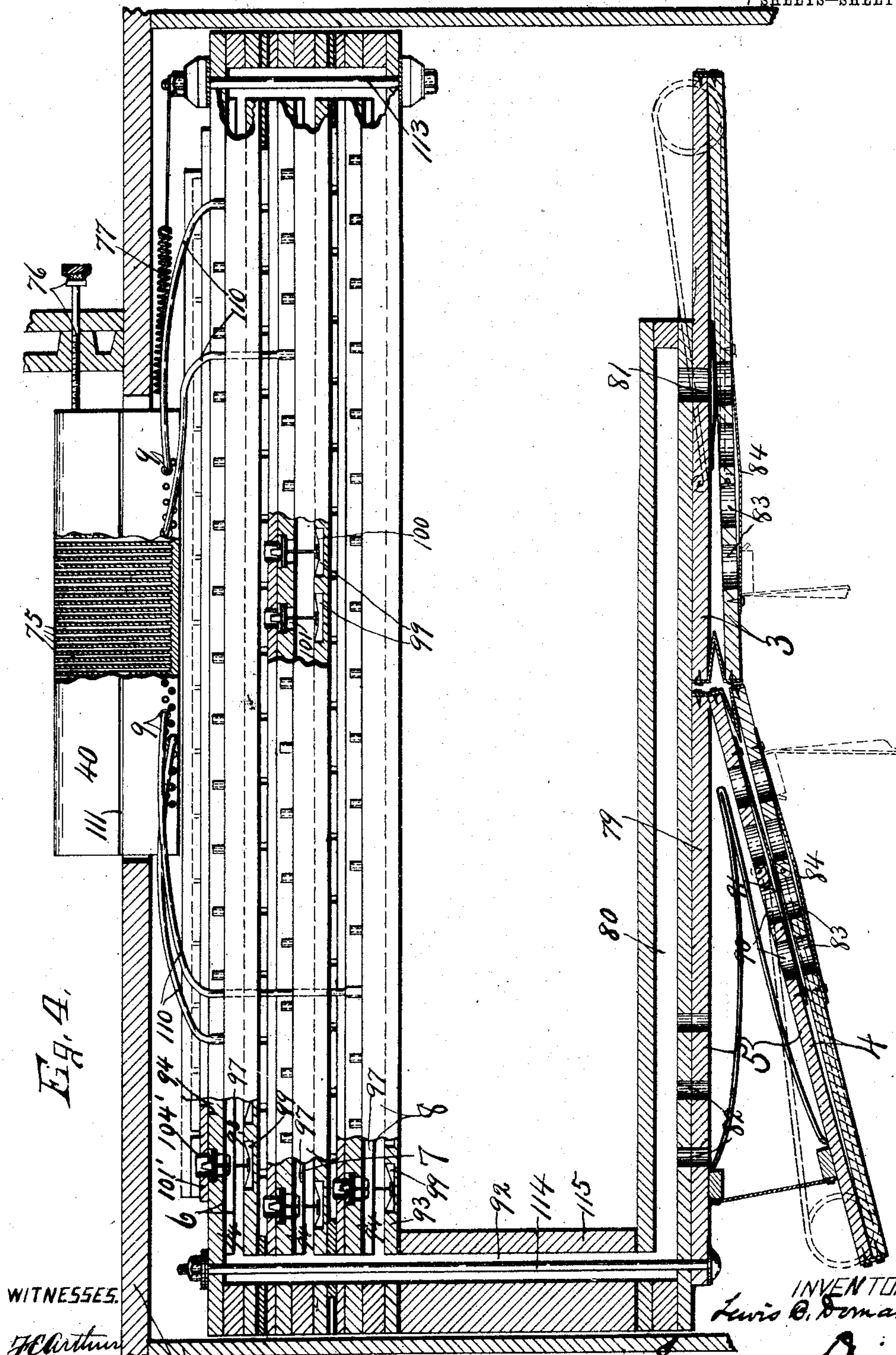
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7 SHEETS—SHEET 4.



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7 SHEETS—SHEET 5.

Fig. 5.

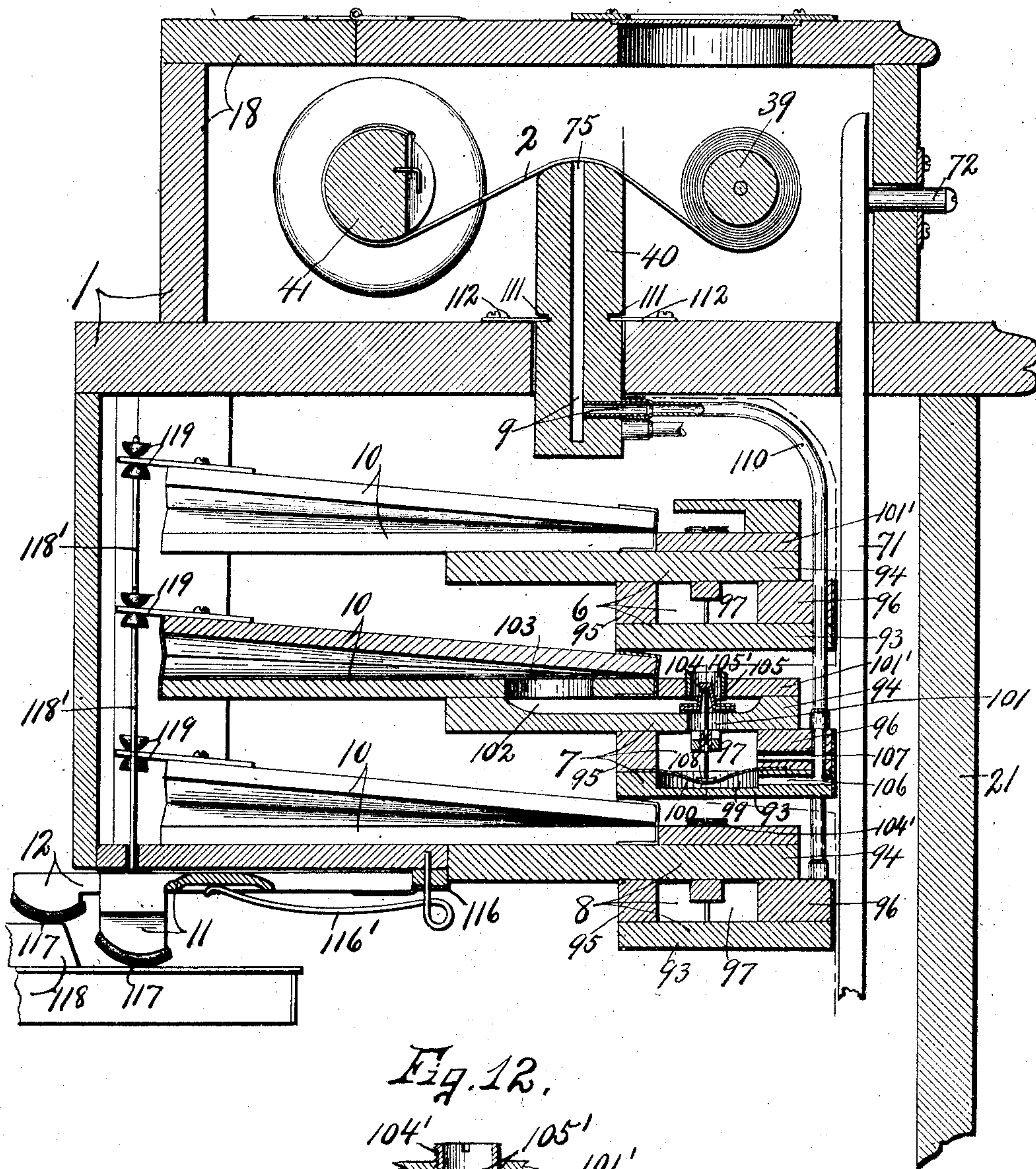
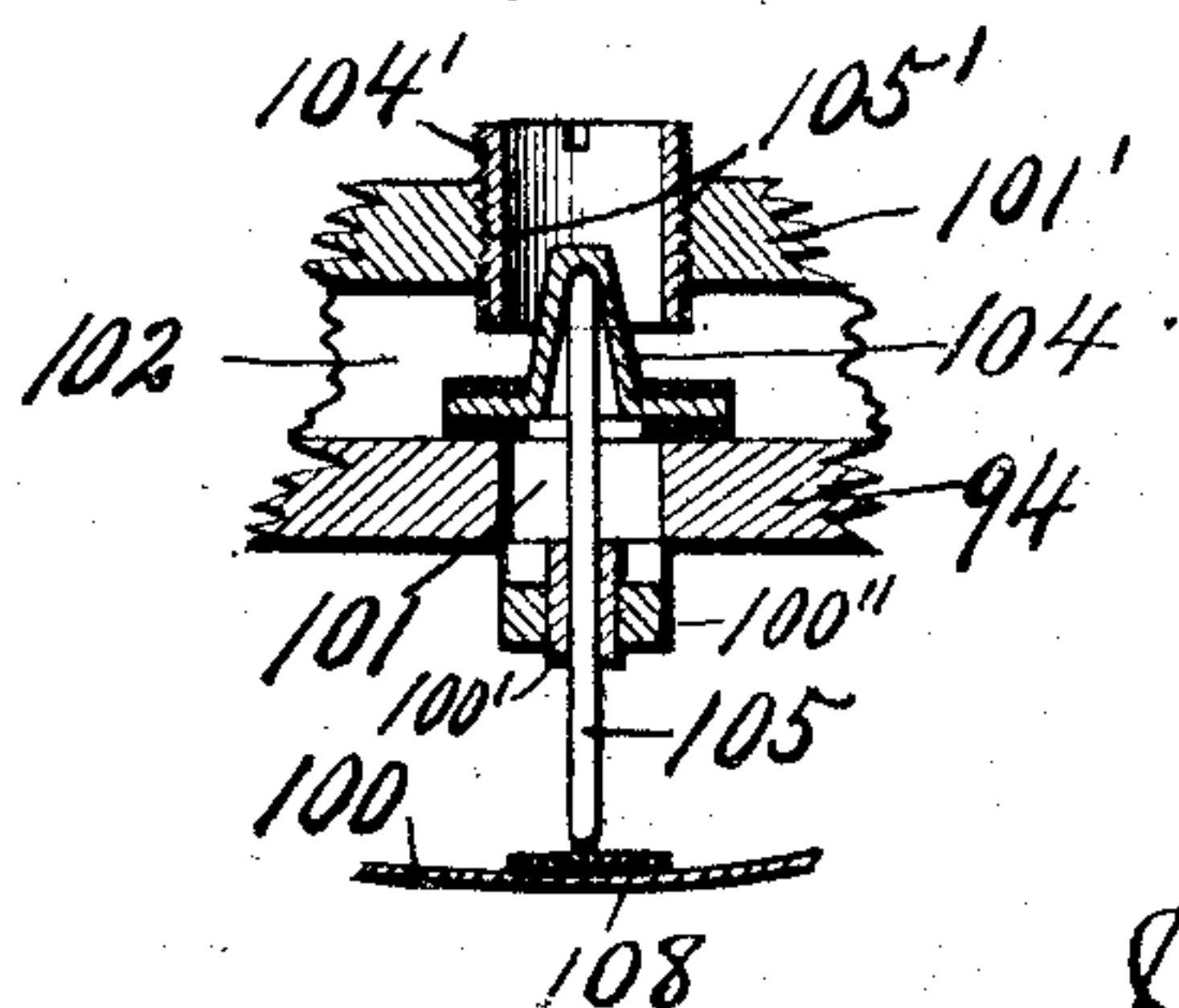


Fig. 12.



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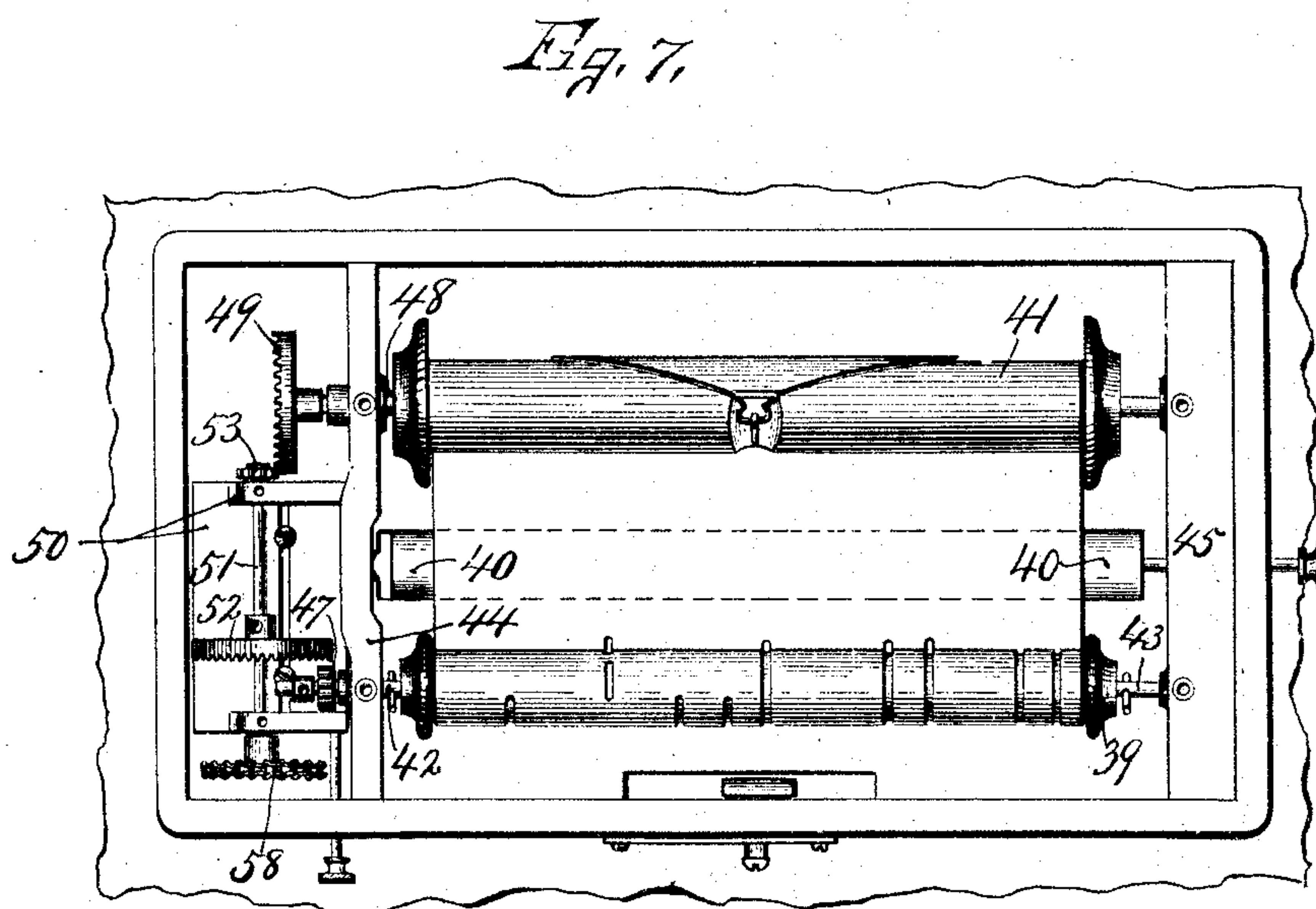
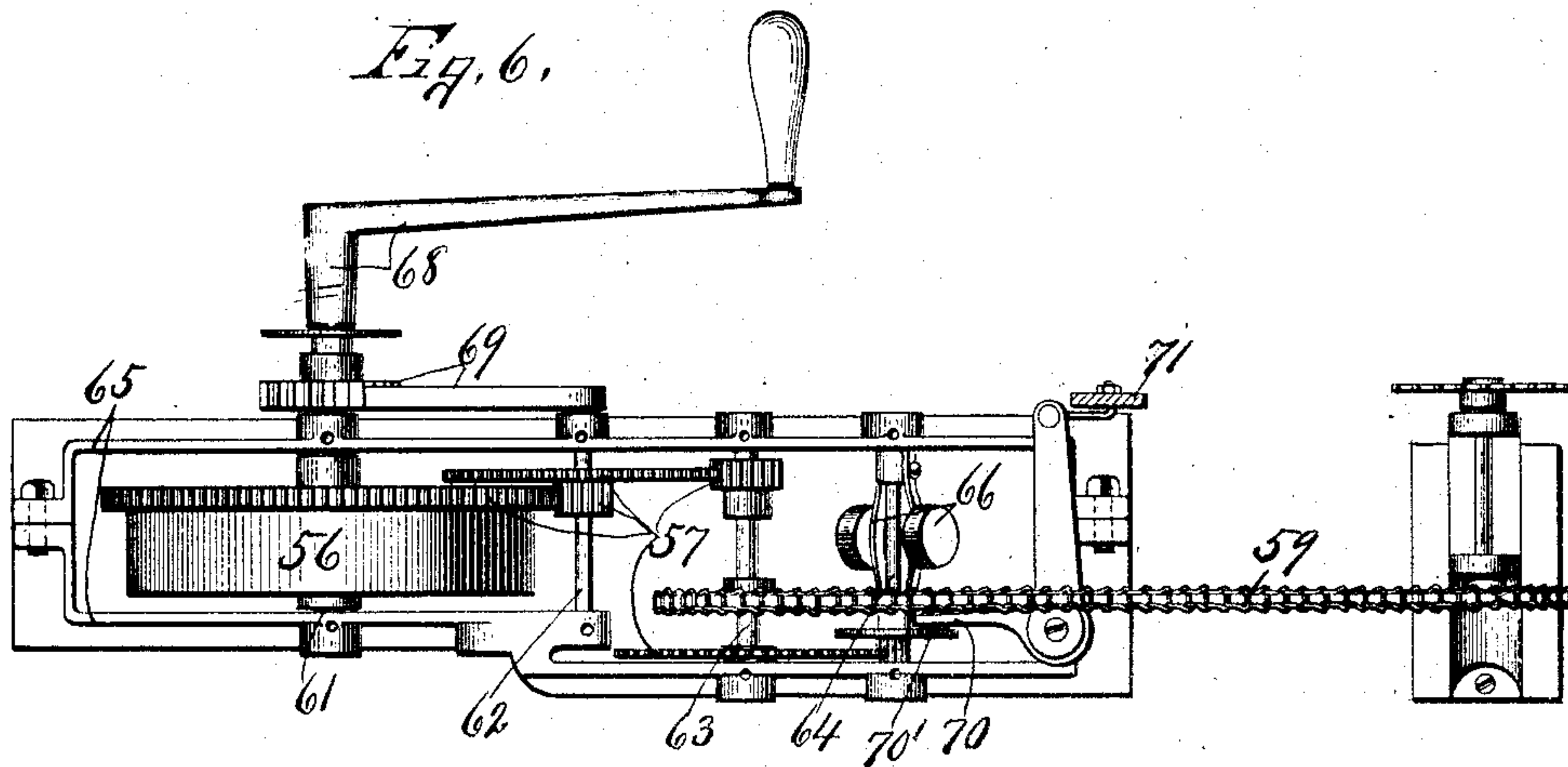
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APPLICATION FILED MAY 31, 1902.

7 SHEETS—SHEET 6.



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PLAYING APPARATUS FOR MUSICAL INSTRUMENTS.

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7 SHEETS—SHEET 7.

Fig. 8.

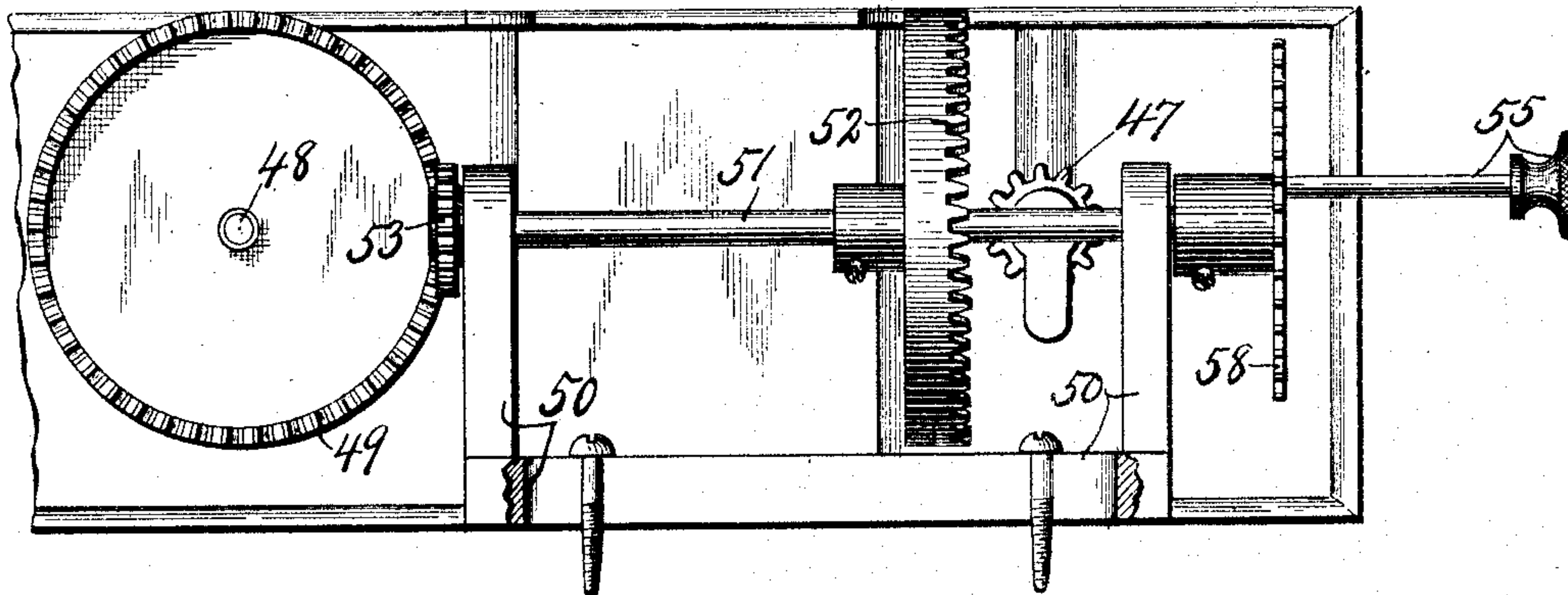


Fig. 9.

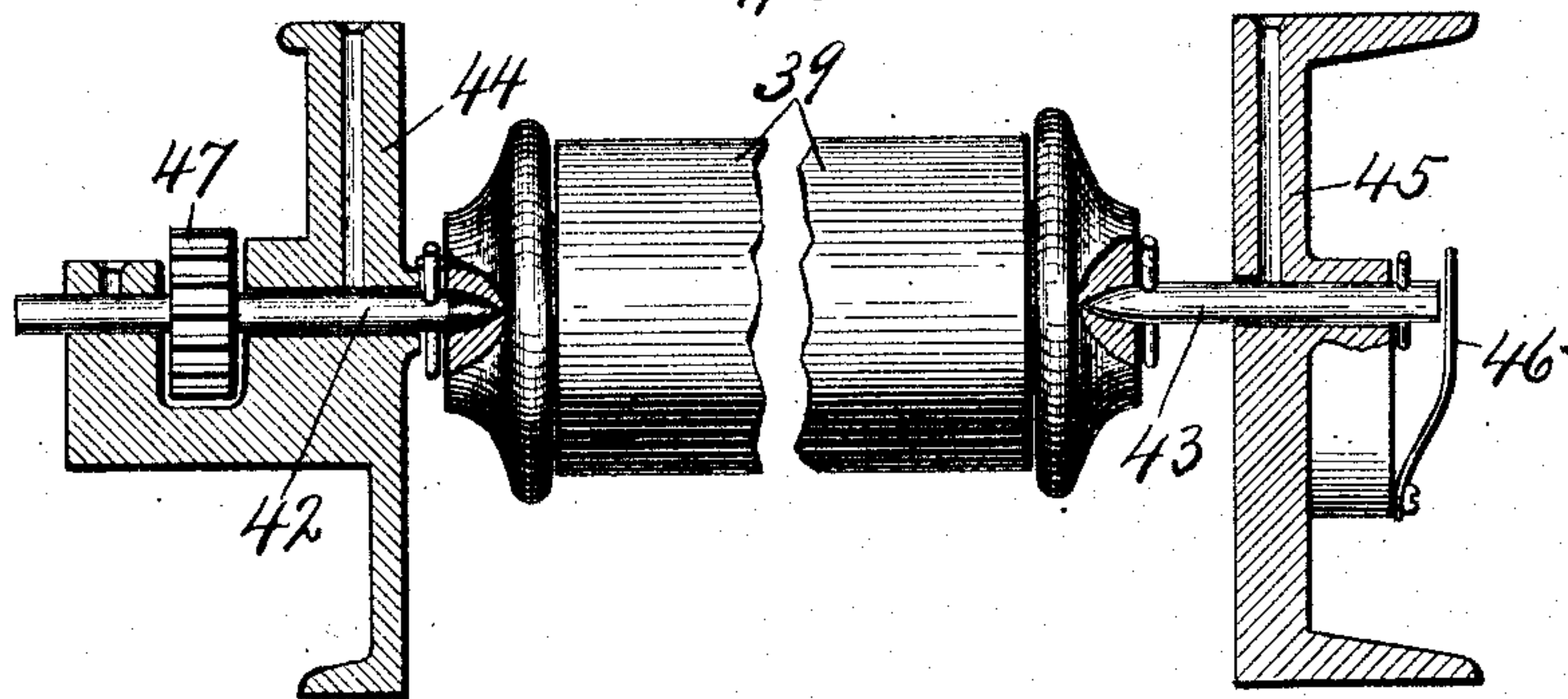
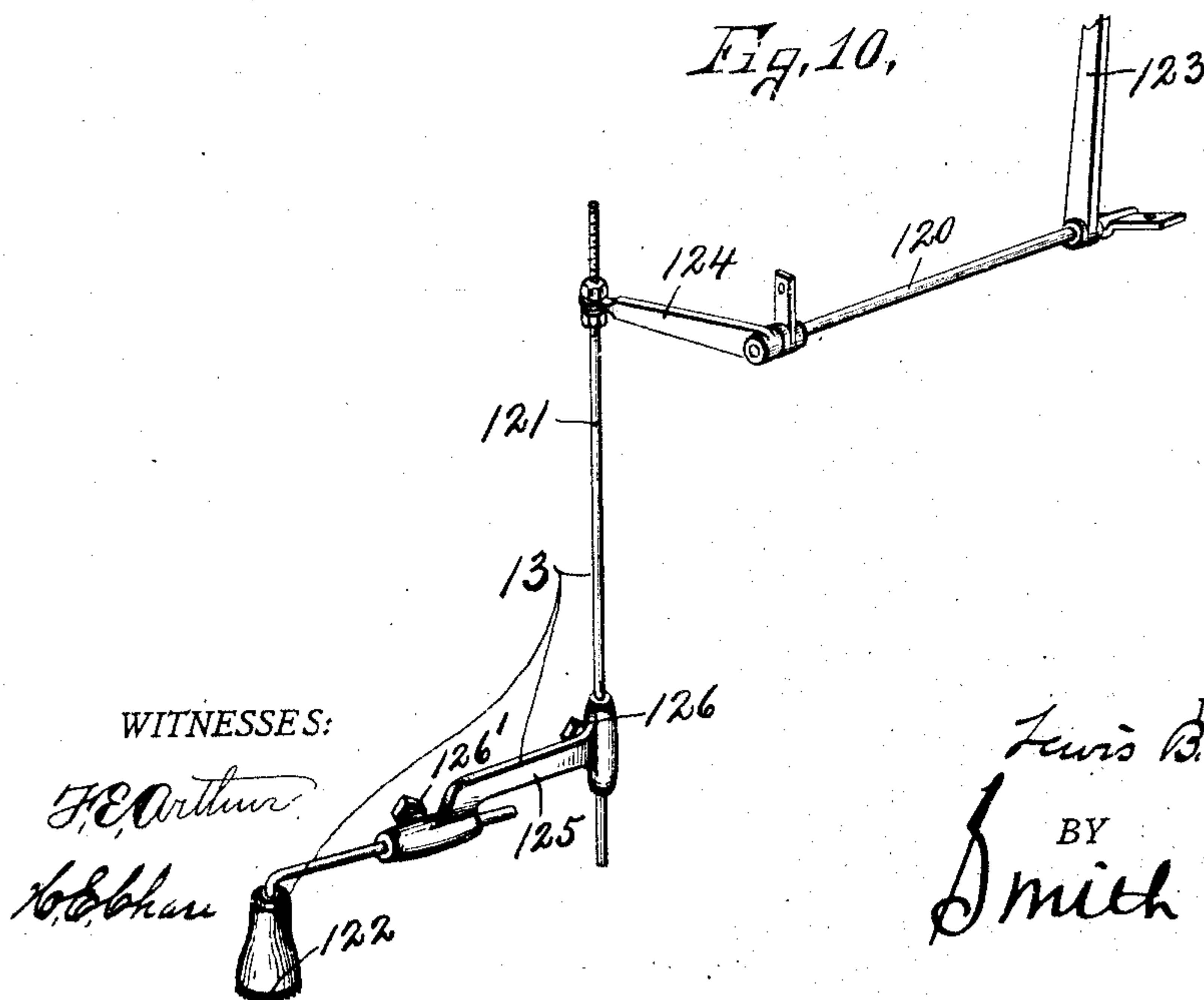


Fig. 10.



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UNITED STATES PATENT OFFICE.

LEWIS B. DOMAN, OF ELBRIDGE, NEW YORK, ASSIGNOR TO AMPHION PIANO PLAYER COMPANY, OF ELBRIDGE, NEW YORK, A CORPORATION OF NEW YORK.

PLAYING APPARATUS FOR MUSICAL INSTRUMENTS.

No. 814,676.

Specification of Letters Patent.

Patented March 13, 1906.

Application filed May 31, 1902. Serial No. 109,692.

To all whom it may concern:

Be it known that I, LEWIS B. DOMAN, of Elbridge, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Playing Apparatus for Musical Instruments, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to improvements in pneumatic playing apparatus for musical instruments.

This invention involves various objects—viz., first, to simplify the general structure and to thereby reduce the cost of manufacture of this class of apparatus; second, to render the action of the key-operating pneumatics more responsive and instantaneous with less mechanism than has heretofore been employed; third, to provide a plurality of separate valve-shelves each inclosing a group of valves and an exhaust-chamber common to the valves which it incloses; fourth, to establish direct communication between the exhaust-chambers through registering wind-ports, and, fifth, to clamp the shelves together by bolts passing through the registering wind-ports.

Further objects of my invention will appear in the description.

To this end the invention consists in the combination, construction, and arrangement of the parts of a pneumatic playing apparatus, as hereinafter fully described, and pointed out in the claims.

Referring to the drawings, Figure 1 is a perspective view of my complete apparatus forming the subject-matter of this invention, portions of the standards being broken away. Figs. 2 and 3 are respectively rear elevation and top plan of the device seen in Fig. 1, portions of the case being broken away in Fig. 2 and the top wall being removed in Fig. 3 for the purpose of disclosing the interior construction. Figs. 4 and 5 are sectional views taken, respectively, on line 4-4, Fig. 3, and 5-5, Fig. 2. Fig. 6 is a top plan view of the detached driving mechanism for the supporting-rollers of the music-sheet exclusive of the mechanism for reversing the rotation of the rollers. Fig. 7 is a top plan of the winding and rewinding rollers and the reverse-feed

mechanism therefor. Fig. 8 is an end elevation of the reverse-feed mechanism detached from the cut-out and driving mechanism. Fig. 9 is an elevation, partly broken away, of one of the supporting-rollers for the music-sheet and its bearings. Fig. 10 is a perspective view of one of the detached pedal-controlling mechanisms. Fig. 11 is a vertical sectional view through the lower end of one of the standards and the adjacent portions of the base, showing the means for adjusting the case vertically. Fig. 12 shows the metal valve-stem, adjustable valve-seat, and guide for the stem.

Similar reference characters indicate corresponding parts in all the views.

In carrying out the various objects of my invention I employ a supporting frame or cabinet 1, upon which is mounted a moving music-sheet 2; driving mechanisms for the music-sheet; means for reversing the direction of feed of the music-sheet; air-pumps 3 and 4; an equalizing-bellows 5; a series of separable valve-shelves or air-chests 6, 7, and 8; a plurality of air-ducts 9 and a corresponding number of secondary key operating or striking pneumatics 10 for each air-chest; key-operating fingers or hammers 11 and 12, actuated by their respective pneumatics 10; manually-controlled pedal-operating devices 13 and 14 for controlling the expression of the instrument; means for facilitating the adjustment of the case relative to the instrument for the purpose of alining the fingers or hammers 11 and 12 with the corresponding keys of the musical instrument, and additional means for adjusting the case or cabinet vertically to conform to the various heights of keyboards of different instruments.

The cabinet 1 preferably comprises an inclosing case 15, having upright standards 16 and a supporting-base 17, the case 15 being provided with a superimposed music-box 18 for receiving the music-sheet and its supporting-rollers, hereinafter described.

The case 15 is formed with a cut-out 20, extending inwardly from its rear face for receiving the keyboard of the musical instrument and permitting the cabinet to be moved as closely as possible to said keyboard in order that it may occupy a minimum space when in use, the front wall of said case being

provided with a panel 21, which may be readily removed when desired to gain access to the interior mechanism. This case is preferably rectangular in general plan, is formed with corner-posts 24, the bases of which are formed with sockets 25, extending upwardly from their lower end faces for a purpose hereinafter mentioned. The rear posts or corner-pieces beneath the cut-out 20 are provided with adjustable stop-shoulders 26, consisting of brackets having upwardly-projecting studs at their upper ends, while their lower ends are formed with slots 27, elongated vertically for receiving clamping-screws 28. These stops 26 cooperate with suitable blocks or stops 29, provided on the case of the musical instrument beneath the keyboard and formed with V-shaped cut-outs 30, which receive the upwardly-projecting ends of the brackets 26 and limit the inward movement of the cabinet when being placed in operative position relative to the keyboard of the instrument. These stops 26 and V-shaped cut-outs 30 not only serve to limit the inward movement of the cabinet, but also align the fingers 11 and 12 with their respective keys and prevent lengthwise or lateral displacement of the cabinet.

The standards 16 are provided at their upper ends with dowels 30', fitting within the sockets 25, and their lower ends are provided with sockets 31 of substantially the same size as the sockets 25 for receiving studs 32, provided upon the base 17, these studs 32 being substantially the same size as the dowels 30'. Although these dowels and studs fit closely within their respective sockets, they are readily detachable or removable therefrom for the purpose of producing a knocked-down cabinet, it being understood that when it is desired to transport the cabinet from one place to another the base 17 is removed from the standard 16, and the standards are likewise removed from the upper portion of the cabinet, whereupon the base 17 is moved upwardly, and its studs 32 are inserted in the corresponding sockets 25 of the case 15, and the standards are then placed lengthwise of the cabinet adjacent to the base and fastened in position in any desired manner for transportation.

When the apparatus has reached its destination, if it is desired to set the same up it is simply necessary to place the parts in the position seen in Fig. 1. The dowels or studs 32 are preferably provided with threaded sockets extending upwardly from their lower faces for receiving the threaded stems 35 of casters 36, said threaded stems being movable independently of the caster for adjusting the cabinet vertically and is provided with a suitable handpiece 38 for the purpose of facilitating this adjustment.

The music-sheet 2 is mounted upon a roller 39 at one side of a tracker 40, the free end of

the music-sheet being detachably connected to a second roller 41 at the opposite side of the tracker, the upper surface of the tracker forming a bearing for the music-sheet and also serving to tension the same during its feed from one roller to the other. These rollers 39 and 41 are mounted in the music-box 18, the roller 39 being regarded as the rewinding-roller and the roller 41 as the winding-roller, the roller 39 being removably supported upon bearings or studs 42 and 43, one of which, 42, is journaled in a bracket 44, and the other is journaled in a bracket 45 and is movable lengthwise against the action of the spring 46, the opposite ends of the roller being provided with sockets for receiving the adjacent ends of the spindles 42 and 43.

It is apparent from the foregoing description that when it is desired to insert the music-roll 39 in position one end is engaged with the spindle 43 and moved lengthwise against the action of the spring 46, and the other end is then aligned with and engaged with the spindle 42, whereupon the spring 46 automatically clamps the roller in position and at the same time permits its free revoluble movement. The spindle 42 is provided with a pinion 47, and the other roller 41 is mounted upon a spindle 48, to which is secured a gear 49, of greater diameter than the pinion 47.

Mounted in the base of the music-box 18 is a sliding frame 50, upon which is mounted a revoluble shaft 51, carrying a gear 52 and a pinion 53, the gear 52 being adapted to mesh with the pinion 47 when the sliding frame is moved in one direction, and the pinion 53 is arranged to mesh with the gear 49 when the frame is moved to its other position. The pinion 53 is of less diameter than the gear 49 for the purpose of imparting a slow movement to the winding-roller 41, and the gear 52 is of greater diameter than the pinion 47 for the purpose of imparting a more rapid movement to the roller 39 during the operation of rewinding the mechanism. This sliding frame 50 and the gears mounted thereon constitute the reverse-feed mechanism, said sliding movement being effected by a handpiece 55, connected to the frame and extending through the front wall of the music-box, so that said frame may be moved without opening the music-box.

The driving mechanism previously mentioned is preferably connected directly to the shaft 51 for transmitting revoluble motion thereto, and consists of a motor 56 and a train of gearing 57, the last gear of the train being connected to a sprocket-wheel 58, provided upon the shaft 51, by power-transmitting mechanism, as chains 59 and 60. The motor and the several gears of the train of the driving mechanism are mounted upon spindles 61, 62, 63, and 64, which are disposed in substantially the same horizontal plane, one in advance of the other, upon a supporting-

frame 65, the spindle 64 being provided with a governor 66 for controlling the speed of movement of the driving mechanism.

The motor 56 consists of a spring which is rewound when desired by a crank or equivalent device 68, said crank being screw-threaded upon the spindle of the motor and may be removed by unscrewing the same when desired to remove the panel 21, a pawl or ratchet 69 being provided to offset the tension of the spring of the motor. In order that the operator may be able to control the movement of the driving mechanism, I provide a brake-shoe 70, which is connected to a manually-operated lever 71' and is adapted to engage a friction-disk 70', provided upon the governor-spindle, the upper end of the lever 71 being provided with a handpiece 72, projecting through a slot in the front wall of the music-box 18.

The tracker 40 is provided with a series of operating-vents 75, which communicate with and are parts of the ducts 9 and cooperate with the perforations in the music-sheet to effect the operation of the key-operating pneumatics 10 in a manner hereinafter described. In order that the operating-vents may be properly registered with the apertures of the moving music-sheet, I preferably support the tracker in such manner as to be adjusted longitudinally. Any means may be employed for effecting this adjustment; but I preferably use a screw 76, movable in a threaded aperture in the bracket 45 and having its inner end engaged with the adjacent end face of the bridge, the outer end of said screw being provided with a handpiece for rotating the same and adjusting the tracker in one direction against the action of the spring 77, said spring having one end connected to the tracker and its other end connected to a fixed shoulder 78, whereby the tracker is held in engagement with the end face of the adjusting-screw 76. This adjustment of the tracker also serves as a means to transpose the key of the selection being played by shifting the position of the vents so as to aline with different rows of apertures in the music-sheet.

In order to economize in the space and to balance the case as much as possible, I preferably arrange the driving mechanism, including the motor, the train of gearing connected thereto, and the governor, between the air-pumps and the air-chests at the rear of the cut-out 20.

The air-pumps 3 and 4 may be of any desired construction for partially exhausting the air from the equalizing-chamber 5 and air-chests 6, 7, and 8, as well as the ducts 9. I preferably construct these air-pumps 3 and 4, however, in the form of bellows arranged horizontally end to end and mounted upon a cross-bar 79 beneath the driving mechanism, and the equalizing-chamber 5 is also con-

structed in the form of a bellows of less volume than either of the bellows 3 or 4, said equalizing-chamber being connected to the bellows 3 through the medium of an air passage or chamber 80 and branch passages 81 and 82. The movable wall of the said bellows 3 is provided with apertures 83 and a valve 84 upon its outer face for the purpose of closing the passages 83 upon each outward stroke of the movable wall of said bellows, the object of this bellows being to exhaust the air from the equalizing-chamber 5 and also from the air-chests 6, 7, and 8 and ducts 9.

The bellows 4 is similar in construction to the bellows 3 and is operated for the same purpose, both of these bellows being connected to pedals 88 by straps 89, said pedals being mounted upon the base 17. The equalizing-chamber 5 is provided with apertures 90 and a valve 91, arranged and connected to permit the exhaustion of air therefrom by the bellows 4, as the same is operated by the pedal 88 connected thereto, the movable wall of the equalizing-chamber forming one of the walls of the bellows 4. The object of this equalizing-chamber is to create a uniform suction in the air-chests 6, 7, and 8 and conduits 9, so that the stroke of the key-operating pneumatics is always substantially uniform even though the operation of the pedals may temporarily cease. The conduit 80 forms a common channel for the circulation of air through the medium of the bellows 3 and 4 and equalizing-chamber 5 and is connected by an upright conduit or passage 92 to corresponding ends of the air-chests 6, 7, and 8, said air-chests being arranged one above the other and above the conduit 80 and bellows 3 and 4 and equalizing-chamber 5 and are also disposed in a plane above the driving mechanism and are provided with registering wind-ports for direct communication between their exhaust-chambers, presently described.

The several air-chests 6, 7, and 8 are substantially identical in construction, and it will therefore be necessary to describe only one. As seen in the drawings, particularly Fig. 5, each of these air-chests is composed of lower, upper, and side walls 93, 94, 95, and 96, arranged in separated relation to each other for forming an interior exhaust-chamber or main passage 97, which are in direct communication at one end with each other with the upright conduit 92 through the registering wind-ports, and are common to the valves which they inclose. The lower wall 93 is provided with a series of pockets 99, above each of which and between the adjacent faces of the bottom wall 93 and side walls 95 and 96 are secured primary pneumatics, as diaphragms 100, adapted to be operated independently of each other, the pockets in the bottom wall merely serving to permit the free movement of the diaphragms.

The upper wall 94 is the valve-board, provided with a series of apertures 101, alined with the diaphragms 100, said upper wall being also provided with a series of channels 102, having one end communicating with the aperture 101, and its other end communicating with an aperture 103 in the lower wall of the pneumatic 10, thereby connecting the interior of the pneumatic 10 with the main passage 97. I usually provide one of these channels 102 and a corresponding pneumatic 10 for each diaphragm, the connection between the pneumatics 10 and the chamber 97 being normally closed by metallic valves 104, which are centrally balanced upon balancing-pins 105, having their lower ends loosely resting upon the upper face of the diaphragms 100 in such manner that the valves are automatically seated by their own gravity. These valves and their balancing-pins coöperating with their respective diaphragms form an essential feature of my invention, and I preferably connect the channels 102 with the atmosphere through apertures 105', formed in the upper wall of the channel and adapted to receive the upper ends of the valves 104, the central portions of each of said valves being constructed in the form of an inverted cone, and its base is usually substantially flat for engaging the valve-seat at the upper end of the passage 101 and also for engaging a similar valve-seat upon the lower end of the passage 105', this latter passage 105' normally permitting the entrance of air into the pneumatics 10, there being one of these apertures for each pneumatic, and during the registration of a perforation in the music-sheet with one of the vents 75 this valve is operated to close the passage 105' and to open the passage 101 for permitting the partial exhaustion of the air from the corresponding pneumatic 10, and thereby causing the same to collapse for the purpose of operating its finger 11 or 12 to actuate the key of the instrument.

As previously stated, the several vents 75 of the tracker 40 constitute the open ends of the ducts 9, the opposite ends of said ducts terminating in branches 106 and 107, leading, respectively, to the interior of the air-chests at opposite sides of their respective diaphragms 100 for the purpose of equalizing the air-pressure at both sides of the diaphragm, except when one of the perforations of the music-sheet is registered with one of the vents.

The branch duct 106 preferably communicates with the interior of the chest beneath its diaphragm and is usually of greater cross-sectional area than the branch duct 107, the object of this inequality in the cross-sectional area of the branch ducts being to permit the free inflow of the air through the vent and its corresponding duct 9 beneath its diaphragm when one of the perforations of the music-sheet is registered with said vent. Each of

these diaphragms is provided with a central bearing 108, of fiber or equivalent material, and adapted to receive and support the balancing-pins 105 to prevent injury to the diaphragm. Each of these valves 104 is provided with a tapering socket to receive the upper end of its balancing-pin 105, which is of less diameter than the socket and permits a free universal rocking movement of the valve in order that the same may readily seat itself, either upon the lower or upper seat, previously referred to, the balancing-pins 105 being guided in suitable metal bushings 100' in bars 100''.

In this class of instruments it is necessary for the valve 104 to positively close the passages 101 and 105' in order that the action of the key-operating pneumatic controlled thereby may be positive and effective, and I therefore provide one of the passages, as the upper passage 105', with an adjustable seat, consisting of the lower end of a threaded metal bushing 104', movable in an upper plate 109 of each air-chest. When this metal bushing or seat is used, I provide the upper face of the base of the valve 104 with a suitable facing of leather or similar material, so that the passage 105' will be positively closed when the valve is seated against the lower end of the bushing. The channels 102 are formed in the upper face of the plates 94, being enlarged at their inner ends for permitting the free operation of the valves 104, and each is separate from the other and connects the interior of its respective key-operating pneumatics with the corresponding passages 101 and 105' when the corresponding valve 104 is actuated to permit such connection. It will be noted that the packing or seat at the upper end of the passage 101 is secured to the plate 94 and not to the valve, and therefore it is not easily displaced, while the packing on the upper face of the valve is held in place by the central portion of the valve extending therethrough.

Referring to the key-operating fingers, I employ two series, those of one being of greater length than the fingers of the other series, and the key-engaging faces of the fingers of the longer series are wider than the corresponding faces of the fingers of the shorter series, these fingers being arranged side by side and are pivoted at their corresponding ends to any suitable fixed support beneath the lower series of secondary pneumatics 10 and are held in their normal up positions by the springs 116'.

The tracker 40 being movable lengthwise is connected to the air-chests 6, 7, and 8 by flexible conduits 110, which form continuations of the ducts 9 and are connected to the vents 75 by vertical apertures in the bridge, also forming continuations of the vents, the lower end of the flexible conduits 10 being connected to the branch ducts 106 and 107.

In order to support the tracker in its proper relation to the music-sheet and still permit its lengthwise movement, I provide said tracker with opposite lengthwise grooves 111, which receive suitable plates 112, secured to the bottom wall of the music-box, as seen in Fig. 5.

The several air-chests are clamped to each other at one end by a clamping-bolt 113, the opposite ends being similarly clamped to each other and to the support 79 and equalizing-chamber 5 by clamping-bolt 114, passed upwardly through the conduit 92, which is formed in a post or supporting-piece 115 for holding the series of air-chests in separated relation to the lower wall 79.

The fingers 11 and 12 are connected at one end by suitable hinges 116 to the upper wall of the lower air-chest 8 and are held in their normal up position by springs 116', their free ends being provided with pads 117, adapted to engage the keys, as 118, of the musical instrument. (Not shown.) These fingers 11 and 12 are connected to their respective key-operating pneumatics 10 by rods 118', said pneumatics being preferably in the form of a bellows, having their upper walls movable and connected to their respective rods 118' by adjustable shoulders 119 in such position that as the movable wall of the pneumatic 10 is operated the corresponding finger connected thereto is also actuated to operate its to corresponding key, the springs 116' serving return the fingers to their normal positions.

The means for controlling the expression preferably consists of the devices 13, Figs. 1, 2, 3, and 10, there being preferably two of these devices—one for the loud pedal and one for the soft pedal. Each of these devices consists of a rock-shaft 120, an upright bar 121, a pedal-engaging member 122, and a manually-operated lever 123, the rock-shaft 120 being journaled upon the lower side of the case 15 and provided with an arm 124, adjustably secured to the upright bar 121 in such manner that as the shaft 120 is rocked by means of the lever 123, which is also secured to the rock-shaft, the bar 121 is reciprocated vertically. Adjustably secured to the lower end of this bar 121 is a bracket 125, held in position by a set-screw 126 and projecting laterally from said bar, the outer end of the bracket being provided with a socket in which is adjustably secured the pedal-engaging member 122, which is held in position by a set-screw 126'. It is evident upon reference to the description and drawings the pedal-engaging member 122 is adjustable vertically and horizontally and the rod 121 being mounted upon the free end of the arm 124 in such manner as to rotate thereon the member 122 is also free to swing horizontally aside from its vertical and horizontal adjustment, the object of this swinging movement being to permit the shift of the member 122

to either pedal of the instrument and the object of the vertical and horizontal adjustment being to adapt the device to pianos of various makes.

The upper ends of the levers 123 are provided with handpieces 128, which project through slots in the panel 21 to the outside of the case, by which the operator may readily control the expression of the instrument during the execution of any selection.

In the operation of my improved playing apparatus the spring-motor is first tensioned and then the handpiece 72 is rocked to the left from the position seen in Fig. 1 for the purpose of releasing the brake and permitting the operation of the driving mechanism connected to the feed-rollers of the music-sheet, the frame 50 being previously adjusted to feed the music-sheet from the roller 39 to the roller 41. During this movement of the music-sheet the pedals 88 are actuated by the operator to exhaust the air from the equalizing-chamber 5, air-chests 6, 7, and 8, and ducts 9, it being apparent that by withdrawing the air from the chambers 97 it is similarly withdrawn from the ducts 9 and the branch ducts 106 and 107 at opposite sides of the diaphragm. As soon as a perforation of the music-sheet is registered with one of the vents of one of the ducts the air immediately passes down through that particular duct and through the branch duct 106 of greater cross-sectional area beneath the corresponding diaphragm 100, whereupon the partial vacuum in the chamber 97 causes the diaphragm to instantly elevate, carrying the balancing-pin 105 and elevating the valve 104 to open the passage 101 and close the passage 105', thereby causing a partial vacuum in the corresponding pneumatic 10 through the channel 102 and passage 103, this vacuum in the pneumatic 10 causing it to immediately collapse and to operate a finger connected thereto for actuating a corresponding key of the musical instrument. In like manner all of the pneumatics may be operated as the several perforations of the music-sheet are presented to the vents 75, corresponding with the particular pneumatic to be operated.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be noted that some change may be made in the detail construction and arrangement without departing from the spirit thereof and that I am entitled to all substantial equivalents of any element of my structure.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a pneumatic self-playing musical instrument the combination of a plurality of separable valve-shelves having exhaust-

chambers and registering wind-ports for direct communication between said exhaust-chambers and a means passed through said registering ports for clamping the valve-shelves together.

2. In a pneumatic self-playing musical instrument the combination of a plurality of separable valve-shelves disposed one above the other and provided with registering wind-ports in contiguous sides, said valve-shelves having exhaust-chambers communicating with each other through said registering wind-ports and a clamping-bolt passed through the registering wind-ports for clamping the shelves together.

3. In a pneumatic self-playing musical instrument a plurality of separable valve-shelves each inclosing a group of valves and an exhaust-chamber which is common to the valves which it incloses, said shelves having registering wind-ports for direct communication between the exhaust-chambers.

4. In a pneumatic self-playing musical instrument a plurality of separable valve-shelves each inclosing a group of valves and an exhaust-chamber which is common to the valves which it incloses, said shelves having registering wind-ports for direct communication between the exhaust-chambers, and means passed through said registering ports for clamping the shelves together.

5. In a pneumatic self-playing musical instrument a plurality of separable valve-shelves each having an exhaust-chamber inclosing a definite group of valves, said shelves being provided with registering wind-ports in contiguous sides near one end for direct communication between the exhaust-chambers and means for clamping said shelves together.

6. In an instrument of the class described, a plurality of separable valve-shelves spaced apart one above the other and having connected registering wind-ports in contiguous sides for direct communication between the interiors of said shelves, each shelf inclosing a definite group of valves, and an exhaust-chamber common to the valves which it incloses and including a valve-board coextensive with its exhaust-chamber, said valve-board having a series of channels one for each valve, in combination with a series of striker-pneumatics each in communication with one of said channels.

7. In an instrument of the class described, a plurality of separable valve-shelves each containing a definite group of valves and an exhaust-chamber common to the valves which it incloses, said valve-shelves having

registering wind-ports for direct communication between said exhaust-chambers, each valve-shelf including a valve-board having a top plate provided with a series of ports opening to atmosphere and a series of tubular valve-seats each adjustably mounted in one of said ports.

8. In an instrument of the class described, a plurality of valve-shelves spaced apart one above the other, each containing a definite group of valves and an exhaust-chamber common to the valves which it incloses, said valve-shelves having connected registering wind-ports for direct communication between the exhaust-chambers, a group of primary pneumatics one for each valve, a series of tubes permanently secured in each valve-shelf and each connected to one of the primary pneumatics, each of the upper shelves having an opening therethrough in vertical alinement with the tubes of the next lower shelf, in combination with a tracker and flexible conduits leading from the tracker through the openings in the upper shelves and attached to the tubes of the lower shelves, whereby the adjacent ends of the flexible conduits are held in fixed relation to the tubes to which they are attached.

9. In an instrument of the class described, a plurality of separable valve-shelves each inclosing a definite group of valves and a corresponding number of primary pneumatics and also having an exhaust-chamber common to the valves which it incloses, said shelves having registering wind-ports for direct communication between the exhaust-chambers, and means to clamp the shelves together, in combination with a tracker having its ducts connected to their respective primary pneumatics, and a series of striker-pneumatics each controlled by one of said valves.

10. In a piano-player, the combination with a series of finger-levers each operatively connected with a motor and an individual valve mechanism for controlling the same; of a plurality of separable valve-shelves, each inclosing a definite number of said valves and each comprising a vacuum-chamber common to the valves which it incloses; and, registered wind-ports in the respective valve-shelves, for direct communication between said vacuum-chambers, substantially as set forth.

In witness whereof I have hereunto set my hand this 23d day of May, 1902.

LEWIS B. DOMAN.

Witnesses:

FLORENCE WETHERBY,
MATIE ELLIOTT.